

VERSION WITH MARKINGS TO SHOW CHANGES MADE

WE CLAIM:

1. A reactive dye compound comprising:

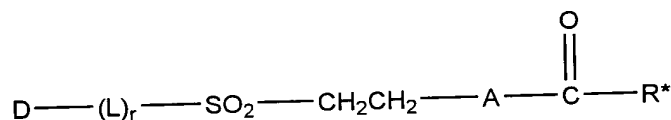
- (a) at least one chromophore moiety
- (b) at least one  $\text{SO}_2\text{C}_2\text{H}_4$  group which is attached to the chromophore moiety either directly via the sulphur atom of the  $\text{SO}_2\text{C}_2\text{H}_4$  group or via a linking group L;

wherein [characterised in that] at least one  $\text{SO}_2\text{C}_2\text{H}_4$  group is substituted on its terminal carbon atom with at least one Y group wherein Y is  $-\text{A}(\text{CO})\text{R}^*$  wherein A is [selected from] O or S and wherein  $\text{R}^*$  is an organic residue which contains at least one nucleophilic group[, such as OH,  $\text{NH}_2$ , SH, COOH, N,  $\text{NHR}^1$  and  $\text{NR}^1\text{R}^2$  wherein  $\text{R}^1$  and  $\text{R}^2$  may be the same or different and may be selected from C1-C4 alkyl];  
and salts thereof.

2. A reactive dye compound according to Claim 1 wherein  $\text{R}^*$  is selected from the group consisting of  $(\text{CH}_2)_n\text{SH}$ ,  $(\text{CH}_2)_n\text{NH}_2$ ,  $\text{CH}(\text{CH}_3)\text{OH}$ ,  $\text{CH}(\text{CH}_3)\text{O}(\text{CO})\text{CH}(\text{CH}_3)\text{OH}$ , derivatives of a polyester of citric acid, [(i.e. a polyester of lactic acid),  $\text{R}^*$  derived from a polyester of citric acid,]  $\text{CH}(\text{OH})(\text{CH}_2\text{COOH})_2$ ,  $\text{CH}_2(\text{OH})(\text{CO}_2\text{H})\text{CH}_2\text{COOH}$ ,  $\text{C}(\text{OH})(\text{H})\text{CH}_2\text{COOH}$ ,  $\text{CH}_2\text{C}(\text{H})(\text{OH})\text{COOH}$ ,  $\text{C}(\text{OH})(\text{H})\text{C}(\text{OH})(\text{H})\text{COOH}$ ,  $(\text{CH}_2)_n\text{NHR}^1$ ,  $\text{CH}_2\text{NR}^1\text{R}^2$ ,  $\text{CH}_2\text{NHNH}_2$ ,  $\text{CH}_2\text{NHOH}$ ,  $\text{CH}_2\text{SMe}$ ,  $\text{CHNH}_2(\text{CH}_2)_n(\text{COOH})$ ,  $\text{CHNH}_2\text{CH}_2\text{SSCH}_2\text{CHNH}_2\text{COOH}$ ,  $\text{CHNH}_2\text{CH}_2\text{SO}_3\text{H}$ ,  $\text{C}_6\text{H}_4\text{OH}$ ,  $\text{C}_6\text{H}_4\text{COOH}$ ,  $\text{C}_6\text{H}_4\text{NH}_2$ ,  $\text{C}_6\text{H}_4\text{N}$ ,  $(\text{CH}_2)_n\text{C}_6\text{H}_4\text{N}$ ,  $\text{CH}(\text{R}\#)\text{NH}_2$ ,  $(\text{CH}_2)_n\text{-SSO}_3^-$ ,  $(\text{CH}_2)_n\text{-S-S-}(\text{CH}_2)_n$ , peptides and polypeptides [peptide of polypeptide]; wherein  $\text{R}_1$  and  $\text{R}_2$  is independently selected from C1-C4 alkyl, wherein n is an integer in the range of 1 to 4 wherein within the same molecule n is not necessarily the same integer and wherein  $\text{R}\#$  corresponds to an amino acid sidechain.

3. A reactive dye according to claim 2 [Claim 1 or 2] wherein  $\text{R}^*$  is selected from the group consisting of  $(\text{CH}_2)_n\text{SH}$ ,  $(\text{CH}_2)_n\text{NH}_2$ ,  $\text{C}_6\text{H}_4\text{N}$ ,  $\text{CH}(\text{R}\#)\text{NH}_2$ ,  $\text{CH}(\text{CH}_3)\text{OH}$ ,  $\text{CH}(\text{CH}_3)\text{O}(\text{CO})\text{CH}(\text{CH}_3)\text{OH}$ ,  $\text{C}(\text{OH})(\text{CH}_2\text{COOH})_2$ ,  $\text{CH}_2\text{C}(\text{OH})(\text{COOH})\text{CH}_2\text{COOH}$ ,  $\text{C}(\text{H})(\text{CH}_3)\text{OH}$ ,  $\text{C}(\text{H})(\text{OH})\text{CH}_2\text{COOH}$ ,  $\text{CH}_2\text{C}(\text{H})(\text{OH})\text{COOH}$ ,  $\text{C}(\text{H})(\text{OH})\text{C}(\text{H})(\text{OH})\text{COOH}$ ,  $\text{C}_6\text{H}_4\text{OH}$ , [and]  $\text{C}_6\text{H}_4\text{NH}_2$ .

4. A reactive dye compound according to claim 3 [any of Claims 1 to 3] wherein R\* is C(OH)(CH<sub>2</sub>COOH)<sub>2</sub> or CH<sub>2</sub>C(OH)(COOH)CH<sub>2</sub>COOH.
5. A reactive dye compound according to claim 1 [any of Claims 1 to 4] wherein A is O.
6. A reactive dye compound having the formula (I):

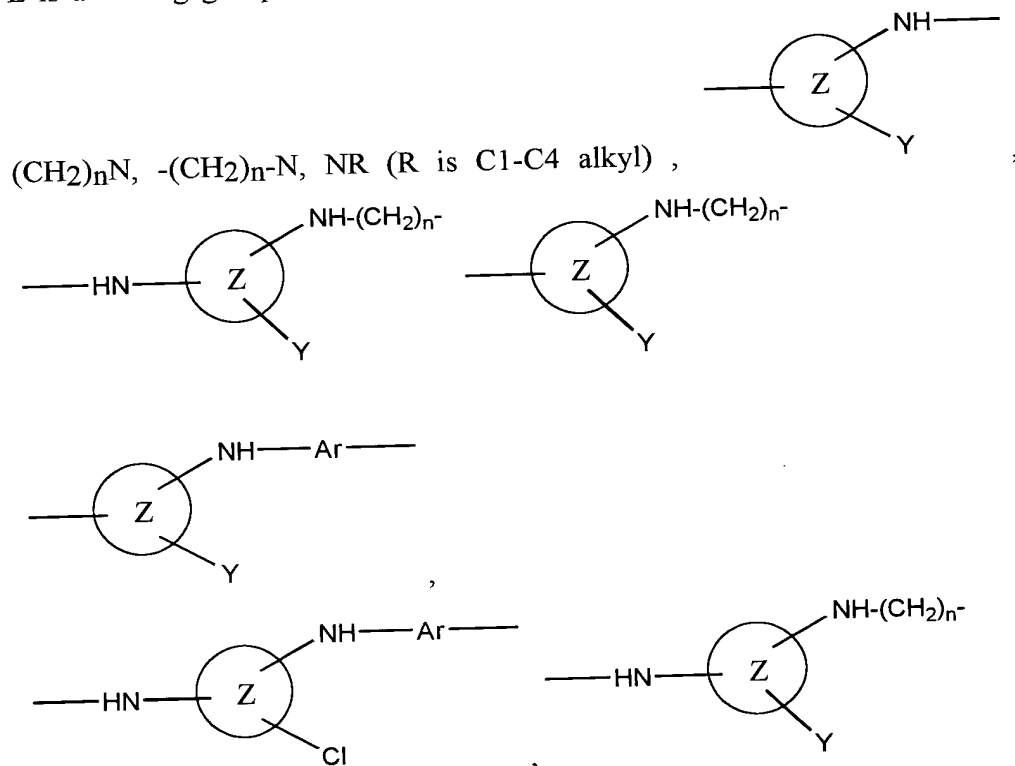


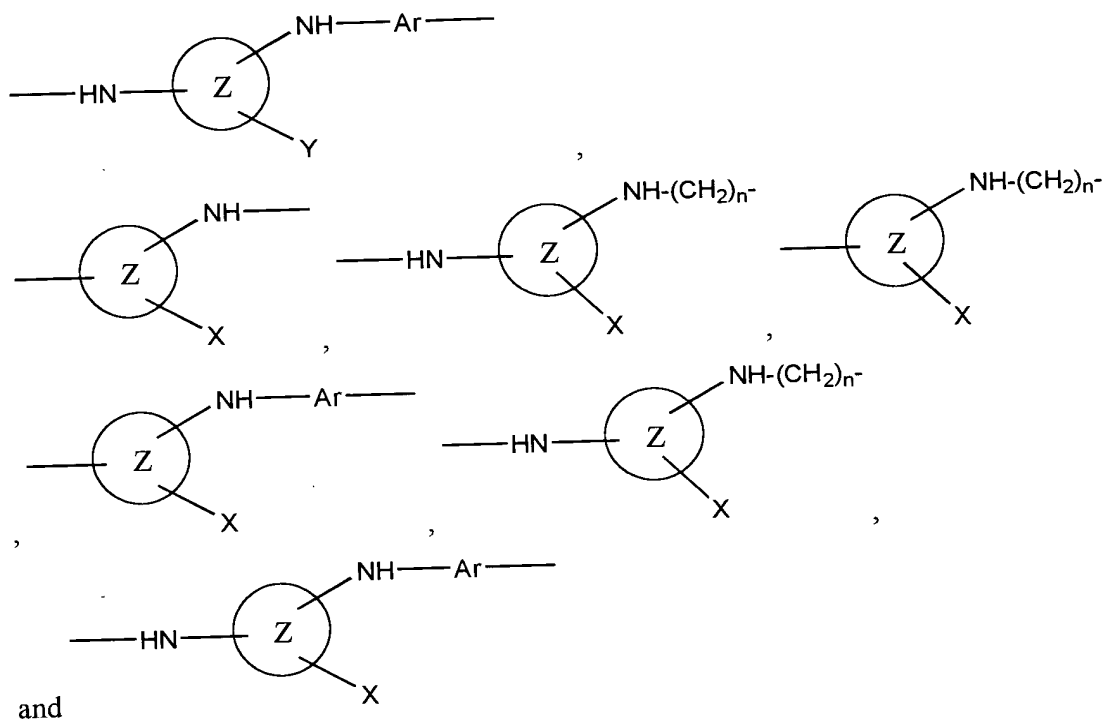
(I)

wherein: D is a chromophore group;

r is 0 or 1;

L is a linking group selected from the group consisting of NH, (CH<sub>2</sub>)<sub>n</sub>, N-





wherein Ar is an aryl group[, preferably benzene], Y is halogen or  $O(C=O)R^*$ , n is an integer of from 1 to 4, Z is a nitrogen-containing heterocycle, X is selected from the group consisting of thio-derivatives, halogens [halogen (preferably fluorine and chlorine)], amines, alkoxy groups, carboxylic acid groups, CN, N<sub>3</sub>, and quaternized nitrogen derivatives (Q<sup>+</sup>)[, Q<sup>+</sup>];

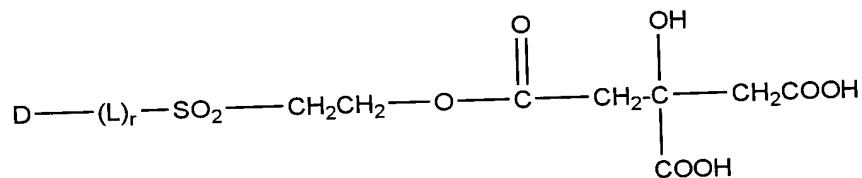
A is O or S,

R\* is selected from the group consisting of (CH<sub>2</sub>)<sub>n</sub>SH, (CH<sub>2</sub>)<sub>n</sub>NH<sub>2</sub>, CH(CH<sub>3</sub>)OH, CH(CH<sub>3</sub>)O(CO)CH(CH<sub>3</sub>)OH, derivatives of a polyester of citric acid, [(i.e. a polyester of lactic acid), R\* derived from a polyester of citric acid], CH(OH)(CH<sub>2</sub>COOH)<sub>2</sub>, CH<sub>2</sub>(OH)(CO<sub>2</sub>H)CH<sub>2</sub>COOH, C(OH)(H)CH<sub>2</sub>COOH, CH<sub>2</sub>C(H)(OH)COOH, C(OH)(H)C(OH)(H)COOH, (CH<sub>2</sub>)<sub>n</sub>NHR<sup>1</sup>, CH<sub>2</sub>NR<sup>1</sup>R<sup>2</sup>, CH<sub>2</sub>NHNH<sub>2</sub>, CH<sub>2</sub>NHOH, CH<sub>2</sub>SMe, CHNH<sub>2</sub>(CH<sub>2</sub>)<sub>n</sub>(COOH), CHNH<sub>2</sub>CH<sub>2</sub>SMe, CHNH<sub>2</sub>CH<sub>2</sub>SSCH<sub>2</sub>CHNH<sub>2</sub>COOH, CHNH<sub>2</sub>CH<sub>2</sub>SO<sub>3</sub>H, C<sub>6</sub>H<sub>4</sub>OH, C<sub>6</sub>H<sub>4</sub>COOH, C<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, C<sub>6</sub>H<sub>4</sub>N, (CH<sub>2</sub>)<sub>n</sub>C<sub>6</sub>H<sub>4</sub>N, CH(R#)NH<sub>2</sub>, (CH<sub>2</sub>)<sub>n</sub>-SSO<sub>3</sub><sup>-</sup>, (CH<sub>2</sub>)<sub>n</sub>-S-S-(CH<sub>2</sub>)<sub>n</sub>, peptide and polypeptide derivatives linked to the vinylsulphone group via their terminal carboxylic acid group [R\* derived from peptide or polypeptide linked to the vinylsulphone group via its terminal carboxylic acid group]; wherein R<sub>1</sub> and R<sub>2</sub> is independently selected from C<sub>1</sub>-C<sub>4</sub> alkyl, wherein n is an integer in the range of 1 to

4 wherein within the same molecule n is not necessarily the same integer and wherein R# corresponds to an amino acid sidechain;

and salts thereof.

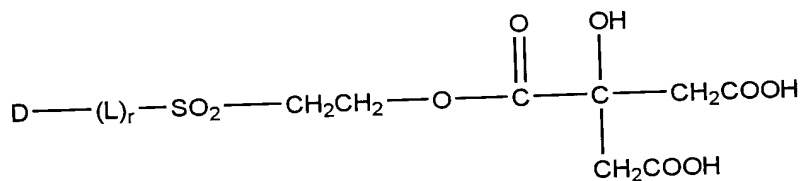
7. A reactive dye according to Claim 6 wherein R\* is selected from the group consisting of  $(CH_2)_nSH$ ,  $(CH_2)_nNH_2$ ,  $C_6H_4N$ ,  $CH(R\#)NH_2$ ,  $CH(CH_3)OH$ ,  $C(OH)(CH_2COOH)_2$ ,  $CH(CH_3)O(CO)CH(CH_3)OH$ ,  $CH_2C(OH)(COOH)CH_2COOH$ ,  $C(H)(CH_3)OH$ ,  $C(H)(OH)CH_2COOH$ ,  $CH_2C(H)(OH)COOH$ ,  $C(H)(OH)C(H)(OH)COOH$ ,  $C_6H_4OH$  and [.]  $C_6H_4NH_2$ .
8. A reactive dye according to claim 6 [Claim 6 or 7] wherein R\* is selected from the group consisting of  $C(OH)(CH_2COOH)_2$ ,  $CH_2C(OH)(COOH)CH_2COOH$  and [or a] derivatives of a citric acid polymer.
9. A reactive dye compound according to claim 6 [any of Claims 6 to 8] wherein A is O.
10. A reactive dye compound having the structure:



(Ia)

wherein D, L, r are as defined above.

11. A reactive dye compound having the structure:



(Ib)

wherein D, L and r are as defined above.

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12. Method of using [Use of] a compound according to claim 1 [any of Claims 1 to 11] for dyeing cellulosic substrates[, preferably cotton].
  13. Method of using [Use of] a compound according to claim 1 [any of Claims 1 to 11] for dyeing wool.
  14. Method of using [Use of] a compound according to claim 1 [any of Claims 1 to 11] for dyeing polyamide substrates[, preferably nylon].
  15. Method of using [Use of] a compound according to claim 1 [any of Claims 1 to 11] for dyeing silk.
  16. Method of using [Use of] a compound according to claim 1 [any of Claims 1 to 11] for dyeing keratin[, preferably hair].
  17. Method of using [Use of] a compound according to claim 1 [any of Claims 1 to 11] for dyeing leather.
  18. Process for the preparation of a compound according to claim 1 [any of Claims 1 to 11] comprising the steps of reacting a first starting material [(preferably one mole)] with a second starting material [(preferably one mole)], the first starting material comprising at least one chromophore, at least one  $\text{SO}_2\text{C}_2\text{H}_4$  which is attached to the chromophore group either directly via the sulphur atom of the  $\text{SO}_2\text{C}_2\text{H}_4$  group or via a linking group L, the second starting material comprising an oxy- or thio-carbonyl group.
  19. Process according to Claim 18 wherein the process is carried out at a pH of from about 2 to about 8[, preferably from about 3 to about 5].
  20. Process according to Claim 18 or 19 wherein the second starting material is added to the first starting material slowly[, preferably dropwise, preferably over several hours, preferably 1-5 hours, more preferably 2-3 hours].
  21. Product obtainable by a process according to claim 18 [to any of Claims 18 to 20].
  22. A dye composition comprising the compound of claim 1 [or product of any of Claims 1 to 11 or 18 to 21].

23. A dye composition according to Claim 22 wherein the composition is in the form of a solid mixture and further comprises an acid buffer.
24. A dye composition according to Claim 22 wherein the composition is in the form of a liquid and further comprises water and an acid buffer.
25. A dye composition according to Claim 22 wherein the composition is in the form of a paste and further comprises water, thickening agent and an acid buffer.
26. A dye composition according to claim 22 [Claim 22, 23, or 25] wherein the pH is [preferably] from about 2 to about 3.

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